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1 1. A plastic lens, comprising:
2 refractive and diffractive optical apparatus
3 configured to produce optothermal changes substantially
4 canceling each other over a predetermined working
5 temperature range to render the plastic lens substantially
6 athermalized over the range.

1 2. The lens of claim 1, comprising
2 a refractive surface and a diffractive optical
3 element, wherein optothermal changes due to the refractive
4 surface counter optothermal changes due to the diffractive
5 optical element.

1 3. The lens of claim 1, wherein the optothermal
2 changes canceling each other include changes affecting the
3 focal length of the lens.

1 4. The lens of claim 1, comprising polycarbonate.

1 5. The lens of claim 1, comprising acrylic.

1 6. The lens of claim 1, wherein the lens has a net
2 positive power.

1 7. The lens of claim 1, wherein an optothermal
2 expansion coefficient of the refractive optical apparatus is
3 higher than an optothermal expansion coefficient of the
4 diffractive optical apparatus.

1 8. The lens of claim 1, comprising a diffractive
2 optical element that is substantially smaller than
3 the lens.

1 9. The lens of claim 1, wherein a first surface of
2 the lens provides substantially all of the negative power of
3 the lens, and a second surface of the lens provides
4 substantially all of the positive power of the lens.

1 10. The lens of claim 1, wherein a surface of the
2 lens provides substantially all of the negative power of the
3 lens and substantially all of the positive power of the
4 lens.

1 11. The lens of claim 1, wherein the diffractive
2 optical apparatus includes a diffractive optical element
3 that is substantially spherical in average.

1 12. The lens of claim 1, wherein a surface of the
2 lens is substantially flat.

1 13. The lens of claim 1, wherein the refractive
2 optical apparatus is divided unevenly between first and
3 second surfaces of the lens.

1 14. The lens of claim 1, wherein substantially all
2 of the diffractive optical apparatus is disposed on one
3 surface of the lens.

1 15. The lens of claim 1, wherein the diffractive
2 optical apparatus is divided substantially evenly between
3 first and second surfaces of the lens.

1 16. The lens of claim 1, wherein the lens includes
2 an axicon

1 17. The lens of claim 16, wherein the axicon
2 includes a polymer.

a1
a2

1 18. The lens of claim 16, wherein the axicon is
2 disposed at a substantially spherical surface of the lens.

1 19. The lens of claim 16, wherein a diffractive
2 optical element and the axicon are disposed at different
3 surfaces of the lens.

1 20. The lens of claim 16, comprising a diffractive
2 optical element that includes at least eight phase levels.

1 21. The lens of claim 16, comprising a diffractive
2 optical element that includes fewer than nine phase levels.

1 22. The lens of claim 16, wherein the axicon is
2 affixed to a surface of the lens.

1 23. The lens of claim 16, wherein the lens has an
2 aspherical surface having the optical properties of a
3 combination of a spherical surface with the axicon.

1 24. The lens of claim 16, wherein the lens includes
2 a doublet.

1 25. The lens of claim 16, wherein the lens includes
2 a Cook triplet anastigmat.

1 26. The lens of claim 16, wherein the lens includes
2 a symmetric double Gaussian.

1 27. The lens of claim 16, wherein the MTF of the
2 lens is higher with the axicon than without the axicon for
3 bar code symbols having spatial wavelengths of 10-20 mils,
4 inclusive.

1 28. The lens of claim 16, wherein the MTF of the
2 lens is at least 0.2 for a 10 mil bar code symbol that is
3 from about 4 to about 16 inches away from the lens.

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